Tested Solution: Protecting your network with Microsoft Network Access Protection (NAP) and Allied Telesis Switches

Today's networks increasingly require protection against attacks that originate from within the network. All too often these LAN-based attacks are released accidentally onto a network when a naive or careless user connects a device infected with malicious software into the LAN. To effectively defend against these internal threats, network administrators need secure LAN switches to inhibit network attacks, and to control network access using Health and Security policies. These policies can ensure that only legitimate users access the network and that the connecting devices conform to strict security requirements.

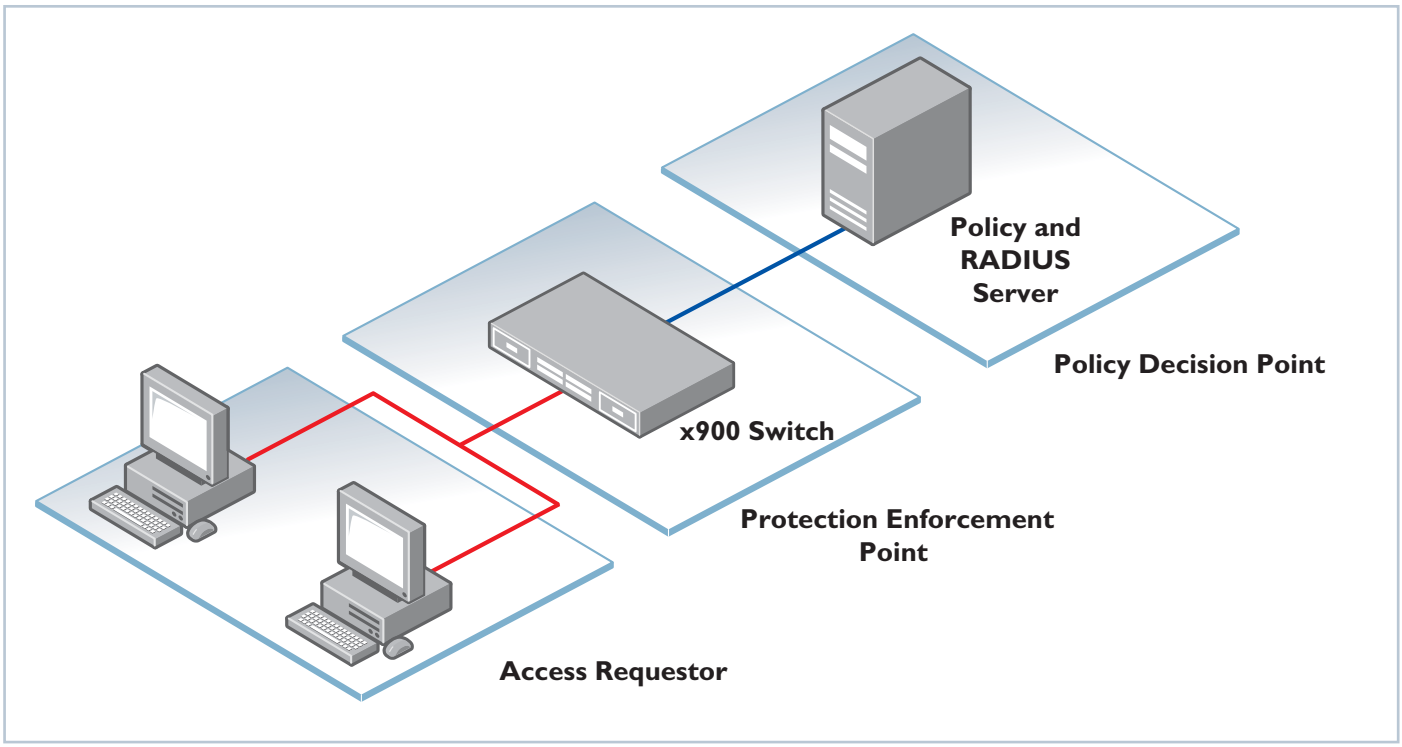


Diagram 1: Network Access Control

The intelligent way to manage Health and Security policies is to set the network to manage itself using a Network Access Control (NAC) solution. NAC is a way of automating policy management on a network, allowing a network administrator to efficiently control network access and manage network security. When a network is secured with a NAC solution, devices must successfully authenticate and conform to the network's security policy before they are allowed normal network access. If a device fails authentication or does not meet the requirements of the security policy, the network can reject access, or grant only limited access until the device has taken remedial action.

There are a number of NAC solutions available in the marketplace. This tested solution focuses on how to secure your network using the NAC solution offered by Microsoft. It also shows you how to configure an Allied Telesis switch as an enforcement point in the network.

For further information about NAC technology, and the NAC features available on Allied Telesis switches, see

"Advanced edge security with NAC"

available from **http://www.alliedtelesis.com/resources/literature/literature.aspx?id=5**

In this tested solution, the Allied Telesis switch acts as a:

- RADIUS Network Access Server (NAS)
- 802.1X authenticator
- DHCP server
- Network Protection enforcement point

The example configuration script in this document is for a switch running the AlliedWare Plus OS, however you can configure switches that run the AlliedWare OS in a similar manner. The Products section at end of this document lists the Allied Telesis products that support NAC solutions.

The Microsoft Solution

The NAC solution offered by Microsoft is known as Network Access Protection (NAP). It allows network administrators to automate policies to protect their network, such as ensuring that legitimate users have client PCs with the:

- most recent Microsoft security patches installed
- latest anti-malware scanners installed and updated
- host-based firewall enabled

This document explains how to configure a simple network protected by NAP. The connecting devices in the example network are PCs using 802.1X authentication. VLAN identifiers are used to separate the PCs based on whether they conform to the network Health policies.

In this document's example network, when a device connects to the network it must initially send an authentication request to the network. All other traffic from it is dropped while it remains unauthenticated. The Microsoft server receives this request and tells the switch what action to take:

- Clients that fail authentication are not allowed access to the network.
- Clients that authenticate but do not meet the security requirements are assigned to VLAN 2, which has access only to network servers.
- Authenticated clients that meet the security requirements are assigned to VLAN 3, which has normal access to the network.

Software Requirements

Microsoft NAP requires a server running Windows Server 2008-either Enterprise, Datacenter, or Standard Edition. Client PCs must run Windows Vista, or Windows XP with Service Pack 3 (SP3) installed.

The following Microsoft software components are configured in NAP solutions:

Microsoft Network Policy Server

This software feature acts as the policy manager and is available on Windows Server 2008. It unifies the processes that are involved in creating and enforcing network access policies—it acts as a RADIUS server, evaluates the Health policy compliance of clients, and determines the network access to grant to clients.

Microsoft Domain Controller

This software feature acts as the authenticator, and is available on either Windows Server 2008 or Windows Server 2003. It is used to:

- Hold a database of username and password information that the Network Policy Server can access when authenticating clients
- Define groups of client PCs, so that you can apply Group Policies to those Client PCs

The Domain Controller can run on the same Windows Server 2008 instance as the Network Policy Server, or on a separate server. In this tested solution, the Domain Controller is on a separate server.

NAP Client Software

This software is included in Windows Vista, and in Windows XP Service Pack 3.

Building the Network

This tested solution uses the example network in figure 1. The client PCs are connected to authenticating ports, while the servers are on non-authenticating ports.

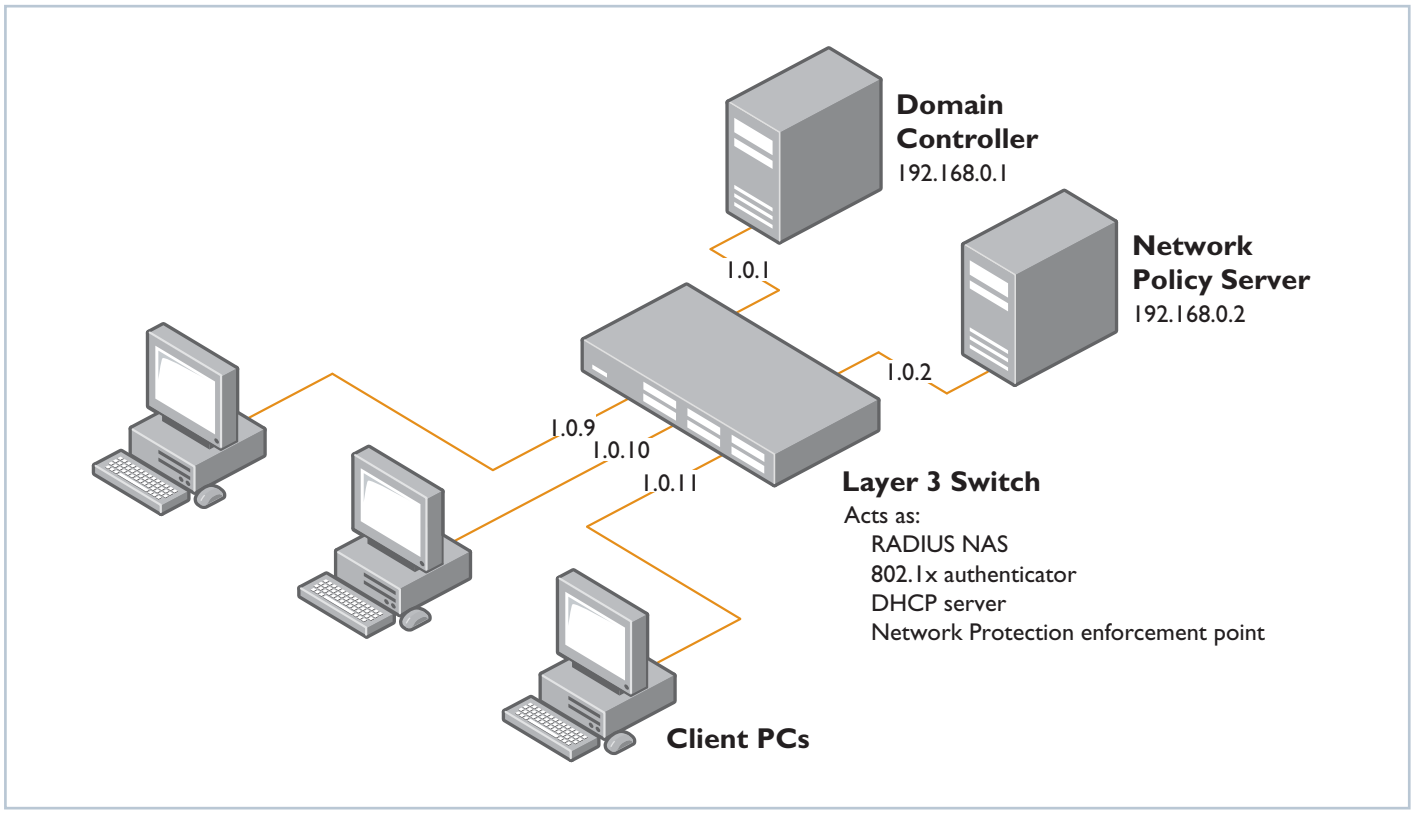


Figure 1: example network

To build this network, follow the three configuration sections of this document. These sections are summarized here:

- **Layer 3 Switch Configuration:**
  Configure the switch to act as a RADIUS NAS, 802.1X authenticator, DHCP server, and Network Protection enforcement point. Create two VLANs, one for compliant PCs, one for noncompliant PCs. Create ACLs to limit access to the network for noncompliant PCs.
- **Server Configuration:**
  Configure the Domain Controller first. On the Domain Controller, configure a domain, the user accounts, and client PC groups. On the Network Policy Server, configure the policies the network requires, and link the Network Policy Server to the Domain Controller.
- **Client PC Configuration:**
  Attach the client PCs to non-authenticating ports so that they can communicate with the Domain Controller. Add the Client PCs to a Client Group with the Domain Controller. Enable 802.1X authentication on the PCs. You can now attach the client PCs to authenticating ports on the switch.

x900 Switch Configuration

Sends authentication requests to the Network Policy Server at 192.168.0.2

```
radius-server host 192.168.0.2 key testing123-2
```

Sets the switch to use the configured RADIUS servers for 802.1X authentication requests

```
aaa authentication dot1x default group radius
```

Creates the DHCP pool for client PCs that the Network Policy Server deems noncompliant. These are allocated an IP address in the range 192.168.2.167 – 192.168.2.200

```
ip dhcp pool NAC-noncompliant
  network 192.168.2.0 255.255.255.0
  range 192.168.2.167 192.168.2.200
  dns-server 192.168.0.1
  default-router 192.168.2.3
  lease 1 1 1
  subnet-mask 255.255.255.0
```

Creates the DHCP pool for client PCs that the Network Policy Server deems compliant. These PCs are allocated an IP address in the range 192.168.3.167 – 192.168.3.200

```
ip dhcp pool NAC-compliant
  network 192.168.3.0 255.255.255.0
  range 192.168.3.167 192.168.3.200
  dns-server 192.168.0.1
  default-router 192.168.3.3
  lease 1 1 1
  subnet-mask 255.255.255.0
```

Enables the DHCP server

```
service dhcp-server
```

Creates the ACLs that will restrict network access to the client PCs. Compliant PCs (with an IP address in the 192.168.3.0 subnet) are allowed normal access to the network.
Noncompliant PCs (with an IP address in the 192.168.2.0 subnet) are allowed access ONLY to the servers.

Allows all DHCP traffic.

Sets the switch to drop all traffic that does not match the other ACLs

```
access-list 3001 permit ip 192.168.3.0/24 any

access-list 3002 permit ip 192.168.2.0/24 192.168.0.1/32
access-list 3003 permit ip 192.168.2.0/24 192.168.0.2/32

access-list 3005 permit udp any range 67 68 any range 67 68

access-list 3006 deny ip any any
```

Creates the compliant and noncompliant VLANs. There are no statically allocated ports on these VLANs. Instead the switch dynamically allocates the ports using the 802.1X VLAN assignment process.

```
vlan database
  vlan 2 name noncompliant
  vlan 3 name compliant
  vlan 2-3 state enable
```

Sets ports 1.0.1-1.0.8 to be non-authenticating ports. Connect servers and routers to these ports.

```
interface port1.0.1-1.0.8
  switchport
  switchport mode access
```

Sets the remaining ports as authenticating ports. The ACLs that constrain the access to the network are applied to these ports.

802.1X is enabled on these ports and configured to accept dynamic VLAN assignment.

```
interface port1.0.9-1.0.24
  switchport
  switchport mode access
  ip access-group 3001
  ip access-group 3002
  ip access-group 3003
  ip access-group 3004
  ip access-group 3005
  ip access-group 3006
  dot1x port-control auto
  dot1x control-direction in
  auth host-mode single-host
  auth dynamic-vlan-creation
```

Allocates IP addresses to all the VLANs on the switch, so that it can L3 switch between these VLANs.

```
interface vlan1
  ip address 192.168.0.3/24
interface vlan2
  ip address 192.168.2.3/24
interface vlan3
  ip address 192.168.3.3/24
```

Server Configuration

This section gives an overview of the configuration steps for the Domain Controller and Network Policy Server. How you configure the Network Policy Server and Domain Controller depends on your specific needs. For detailed instructions consult Microsoft documentation, in particular read the **Step-by-Step Guide: Demonstrate NAP 802.1X Enforcement in a Test Lab** document available on the following webpage: http://www.microsoft.com/windowsserver2008/en/us/nap-technical-resources.aspx

Domain Controller overview

Configure the Domain Server first:

1. Create a Forest.
2. Within the Forest, create a Domain. This houses the user information. The Network Policy Server will also join this domain.
3. Create the user accounts. These accounts hold the username and password that a user must supply when logging into the network.
4. Create a security group for the Client PCs; for example called "NAP Client Computers". You will add each Client PC to this group later. Once a user has authenticated on the network, the PC they are using is checked to see whether it belongs to this security group. The security policies defined in the Network Policy Server are applied to matching Client PCs.
5. Install the Enterprise Root Certificate Authority service. The Network Policy Server receives a certificate from this service.

Network Policy Server overview

To configure the Network Policy Server:

1. Join the domain you have created on the Domain Server.
2. Install Network Policy Server role.
3. Install Group Policy Management feature.
4. Obtain a computer certificate from the Domain Controller.
5. Run the **NPS console (nps.msc)** and create your policies using the configuration Wizard. See Figure 2 for a summary of the policy configuration.

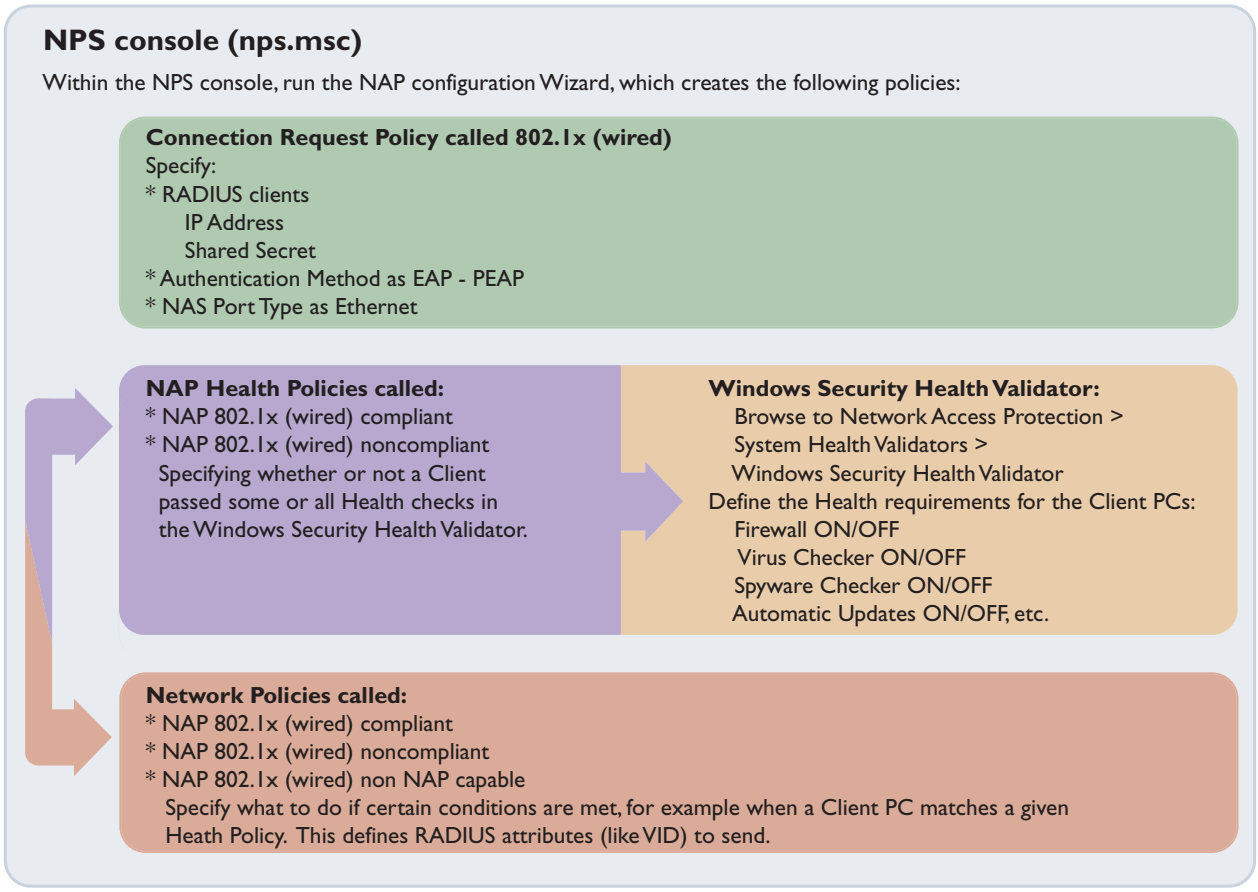


Figure 2: NPS console

6. Run the **Group Policy Management Editor (gpme.msc)** to create a new Group Policy Object. Change the settings for this object as shown in Figure 3.

Group Policy Management Editor (gpme.msc)

Create a new Group Policy Object, called "NAP client settings". Specify the following settings for this Group Policy Object:

Computer Configuration > Policies > Windows Settings > Security Settings > System Services >
Network Access Protection Agent = enable

Computer Configuration > Policies > Windows Settings > Security Settings > System Services >
Wired Auto Config = enable

Computer Configuration > Policies > Windows Settings > Security Settings > Network Access Protection >
NAP Client Configuration > Enforcement Clients >
EAP Quarantine Enforcement = enable

Computer Configuration > Policies > Administrative templates > Windows Components >
Security Center = turn on Security Center (Domain PCs only)

Figure 3: GPM editor

7. Run the Group Policy Management Console (gpmc.msc). Browse to the Group Policy Objects for the domain. An available object will be the "NAP client settings" you created using the Group Policy Management Editor. Under the Security Filtering for this Group Policy Object, add the group "NAP client computers", which is the security group you created within the Domain Controller. This defines the group of client PCs that the Group Policy applies to.

Client PC Configuration

To configure the client PCs, you will need to:

1. Attach the PCs to non-authenticating ports
2. Set each PC to join the domain you have created (described in detail below)
3. Set each PC to use 802.1X authentication
4. Attach the PCs to authenticating ports, and check that the NAP network configuration is working

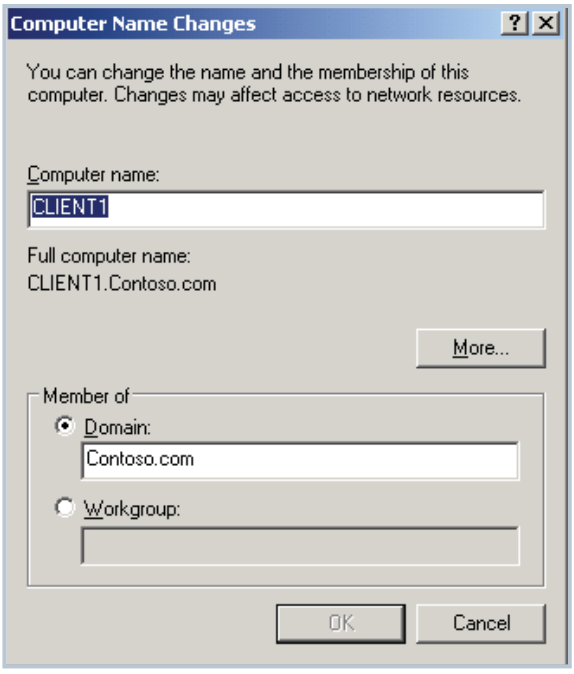
Joining the domain

The clients need to join the domain before you can configure 802.1X authentication on them. Attach the client PCs to non-authenticating ports on the switch so that they can communicate with the Domain Controller and join the domain.

On each client PC, browse to **System Properties > Computer Name** tab, and click **change** to enter the **Computer Name Changes** dialog box:

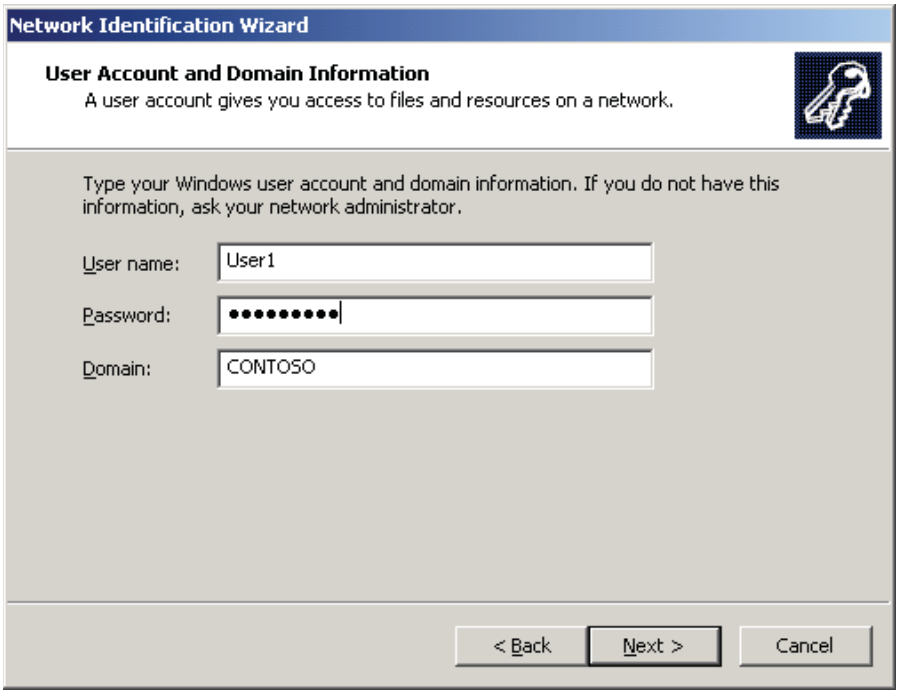
- In the **Computer Name** field, type the name you wish to give the client PC.
- In the **Member of** field, choose **Domain**, and type the name of the domain you created for the network.

Click **OK** to return to the previous window.

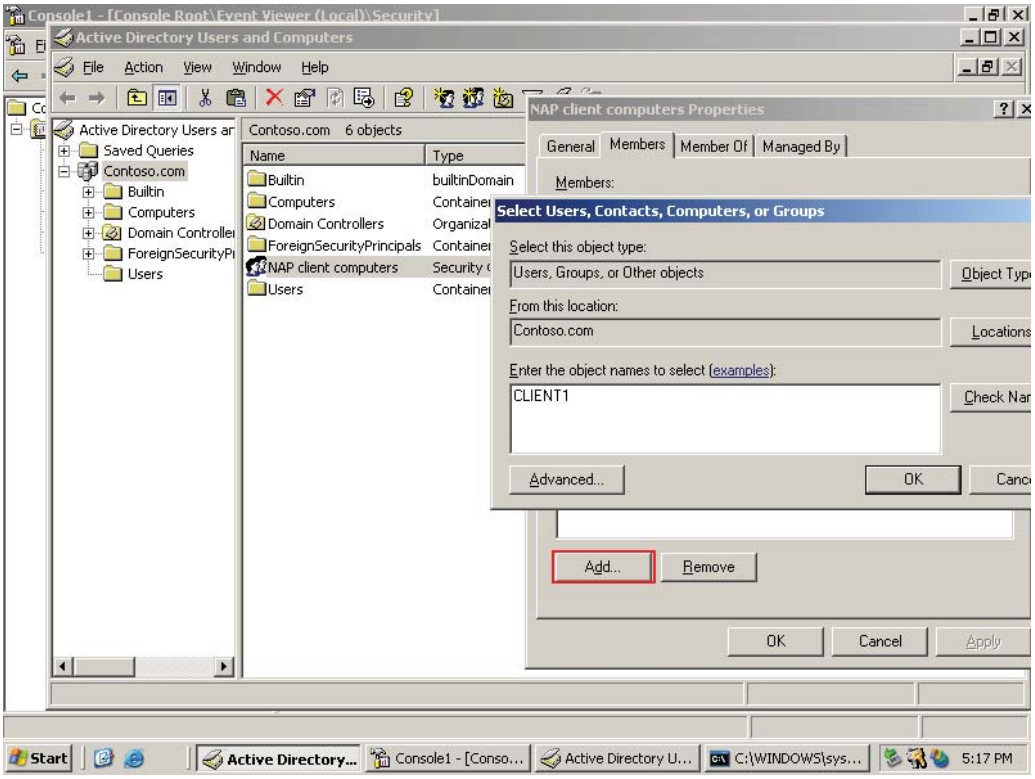


On PCs running Windows XP, you must configure the network settings:

1. In the **System Properties** > **Computer Name** tab, click the **Network ID** button to run the **Network Configuration Wizard**.
2. In the dialog **How do you use this computer?**, choose:
   This computer is part of a business network
3. In the dialog **What kind of network do you use?**, choose:
   My company uses a Network with a domain
4. In the dialog **User account and Domain Information**, specify the **User name**, **Password**, and **Domain** of the user account that you created on the Domain Controller.



On the Domain Controller, add each Client PC to the "NAP client computers" group. This applies the policies set in the "NAP Client Settings" Group Policy Object (created on the Network Policy Server) to the Client PCs.

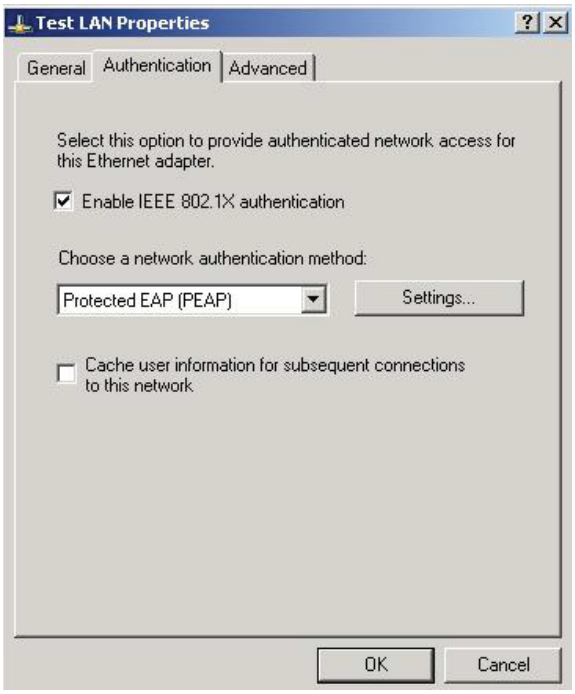


Enabling 802.1X authentication

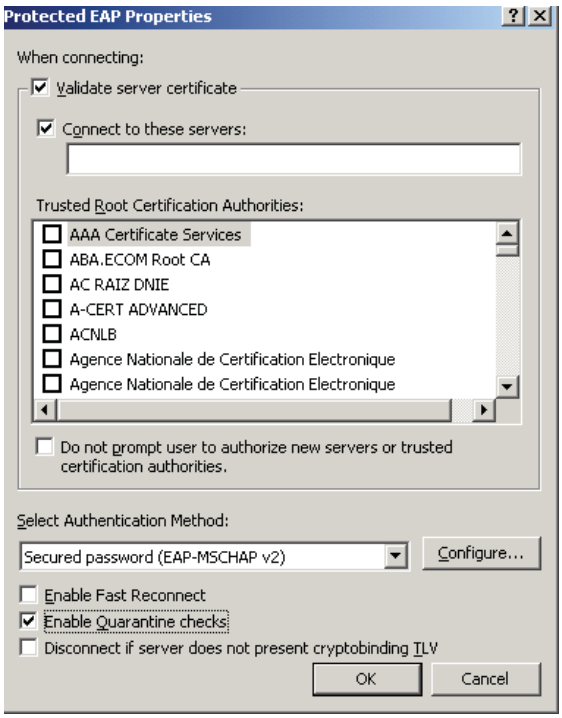
Browse to **start** > **settings** > **Network Connections.** Double-click on the network interface that you are interested in to open the **Status** window for the interface.

Click on the **Properties** button to open the **Properties** dialog for the interface. Select the **Authentication** tab and check that the:

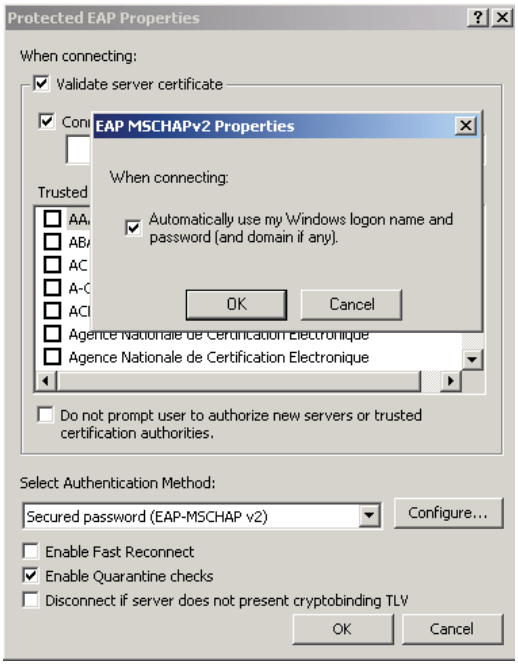
- Enable IEE 802.1X authentication tick box is ticked
- network authentication method is **Protected EAP (PEAP)**



Click on the **Settings** button in this dialog to open the PEAP properties dialog. On the bottom half of the dialog, check that the **Select Authentication Method field** is set to **Secured password (EAP-MSCHAP v2)**.



Click the Configure button in this dialog to open the EAP MSCHAP v2 Properties dialog. Check that the checkbox is ticked.

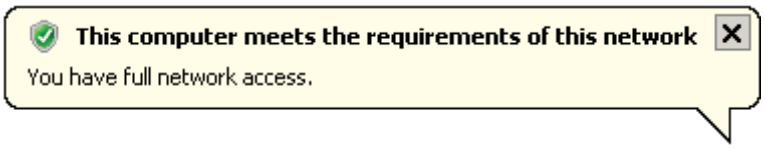


The client PCs are now ready to connect to the network on authenticated ports.

Confirming the NAP network configuration

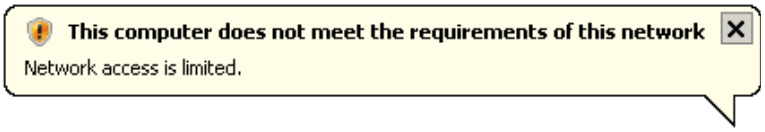
Log into the network using one of the configured PCs. 802.1X authentication should successfully work.

If the state of the PC passes the Health Checks defined in the Windows Security Health Validator on the Network Protection Server, then a bubble will appear near the bottom of the screen confirming this:



The port to which the PC is connected is dynamically assigned to the Compliant VLAN (VLAN 3), as defined by the Network Policy NAP 802.1X (wired) Compliant on the Network Protection Server.

If the state of the PC does not pass the Health Checks defined in the Window Security Health Validator on the Network Protection Server, then a bubble will appear near the bottom of the screen reporting this:



Products

The following Allied Telesis Layer 3 switches, running the Alliedware Plus operating system, will support the configuration detailed in this solution

SwitchBlade® x908

Advanced Layer 3 Modular Switch

SwitchBlade x908

8 x 60Gbps Expansion Bays

x900-12X and 24X Series

Advanced Gigabit Layer 3+ Expandable Switches

x900 Family

x900-24XT

- 2 x 60Gbps Expansion Bays
- 24 x 10/100/1000BASE-T (RJ-45) copper ports

x900-24XT-N

NEBS Compliant

- 2 x 60Gbps Expansion Bays
- 24 x 10/100/1000BASE-T (RJ-45) copper ports

x900-24XS

- 2 x 60Gbps Expansion Bays
- 24 x 100/1000BASE-X SFP ports

x900-12XT/S

- 1 x 60Gbps Expansion Bay
- 12 x combo ports (10/100/1000BASE-T copper or SFP)

About Allied Telesis Inc.

Allied Telesis is a world class leader in delivering IP/Ethernet network solutions to the global market place. We create innovative, standards-based IP networks that seamlessly connect you with voice, video and data services.

Enterprise customers can build complete end-to-end networking solutions through a single vendor, with core to edge technologies ranging from powerful 10 Gigabit Layer 3 switches right through to media converters.

Allied Telesis also offer a wide range of access, aggregation and backbone solutions for Service Providers. Our products range from industry leading media gateways which allow voice, video and data services to be delivered to the home and business, right through to high-end chassis-based platforms providing significant network infrastructure.

Allied Telesis' flexible service and support programs are tailored to meet a wide range of needs, and are designed to protect your Allied Telesis investment well into the future.

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